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REPRODUCTIVE EVALUATION OF HEIFERS

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Development of replacement heifers is a crucial enterprise in the cow/calf operation. Considerable opportunities exist for purebred and elite commercial producers to market bred replacement heifers. Quality control of this product will be essential to developing a consistent market share. However, as progressive producers continue to push for growth and carcass traits, they may select against reproductive efficiency. Several tools are available to evaluate reproductive soundness and efficiency.

Target Weight Concept

Target weight is considered to be the threshold weight for puberty in heifers. Below this weight nutrition and growth rate are the limiting factors to puberty onset. Above this weight, maturation rate of reproductive axis or genetics are the limiting factors to cycling.

Target weight has been defined as 60-65% of mature weight for British influenced heifers and 65-70% of mature weight for continental breeds. Larger framed high growth heifers will be at the upper end of these ranges (see review by Patterson et al., 2000).

Reproductive Tract Scoring

In the late 1980's, researchers in Colorado developed the Reproductive Tract Scoring (RTS) method (Table 1). Research from various locations have demonstrated that this is an effective method for evaluating heifers. When scored between 12 and 14 months of age, heifers with low reproductive scores 1 and 2 have poor reproductive performance during the breeding season. Typical responses for heifers by reproductive tract score are illustrated in Table 2 and 3.

Table 1. Reproductive tract scoring method

Reproductive Tract Score	Uterine Horns	Ovaries			Ovarian structures
		Length (mm)	Height (mm)	Width (mm)	
1	Immature, < 20 mm diameter, no tone	15	10	8	No palpable follicles
2	20-25 mm diameter, no tone	18	12	10	8 mm follicles
3	20-25 mm diameter, slight tone	22	15	10	8-10 mm follicles
4	30 mm diameter, good tone	30	16	12	> 10 mm follicles, corpus luteum possible
5	> 30 mm diameter	>32	20	15	Corpus luteum present

From Anderson et al., 1991

Table 2. Relationship between reproductive tract score, estrus synchronization response and synchronized pregnancy rate. Colorado data (LeFever and Odde, 1986)

Reproductive Tract Score	No. of heifers	Estrous response (%)	Synchronized pregnancy rate (%)
1	22	50.0[a]	0.0[a]
2	59	79.7[b]	17.0[b]
3	92	79.3[b]	37.0[c]
4	29	93.1[bc]	62.1[d]
5	124	96.8[c]	54.0[d]

[a,b,c,d] Percentages with different superscripts within column differ (P<.05)

Table 3. Reproductive tract score and performance during the first breeding season. Kentucky data from 1200 heifers (Patterson et al., 1994)

Reproductive Tract Score	Estrous response (%)	Synchronized* conception rate (%)	Synchronized* pregnancy rate (%)	Pregnancy rate, end of breeding season (%)
1	54	36	19	59
2	67	60	40	92
3	72	60	43	92
4	81	61	50	91
5	83	64	53	92

*All heifers synchronized with MGA + PGF system

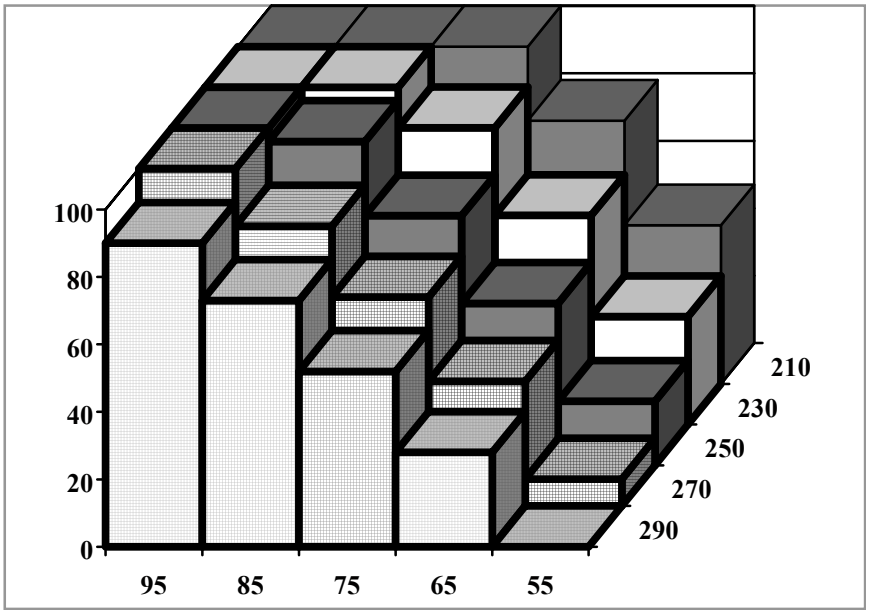
By scoring heifers at 12 months of age, producers may be able to identify heifers that reach puberty early. Heifers that score 4 or 5 at 12 months of age are heifers that reach puberty early. Conversely, late maturing heifers will score 1 and 2 at 14 months of age and could be eliminated.

Pelvic Areas

Pelvic area (PA) is second to calf birth weight in impacting dystocia. Heifers with yearling PA <140 sq. had a greater incidence of dystocia (Deutscher, 1988). Relationship among calf birth weight, PA and dystocia is illustrated in figure 1.

Studies indicate that selecting for increased pelvic area results in larger frame size. Attempts to use PA alone to explain probability of dystocia have met with only limited success due to the greater effect of calf birth weight on dystocia. However, pelvic area still can be used to eliminate those heifers that have an unusually small or a misshapen pelvic opening.

Figure 1. Relationship of heifer pelvic area, calf birth weight and incidence of dystocia in 600 two-year-old heifers (Dzuik and Bellows, 1983)



Relationship Among BW and Reproductive Measures

Recently, several universities including Virginia Tech have been investigating the relationship among body weight, and RTS, pelvic area and fertility. If a specific relationship could be obtained then only heifers that didn't meet a minimum body weight may have to be examined.

The relationship between body weight and RTS in 95 heifers from a single farm is illustrated in Figure 2. The lines indicate 55%, 60%, and 65% of 1100 lb mature weight. All heifers were between 12.5 and 14 months of age. Note that some heifers reached RTS 5 at very low weight while other heifers were RTS 3 even though they exceeded 800 lbs. Average weights for RTS 2, 3, 4, and 5 heifers were 552, 659, 720, and 788 lbs, respectively.

In a larger study, Patterson and co-workers (1994) examined 1200 heifers from Kentucky farms. Heifers that were heavier at the time of reproductive examination had larger pelvic areas and higher RTS scores (Tables 4 and 5). The correlation coefficients they calculated showed a significant positive correlation among BW and pelvic measures and body weight and RTS (Table 5).

Figure 2. Relationship between body weight and reprotract score in a Virginia herd

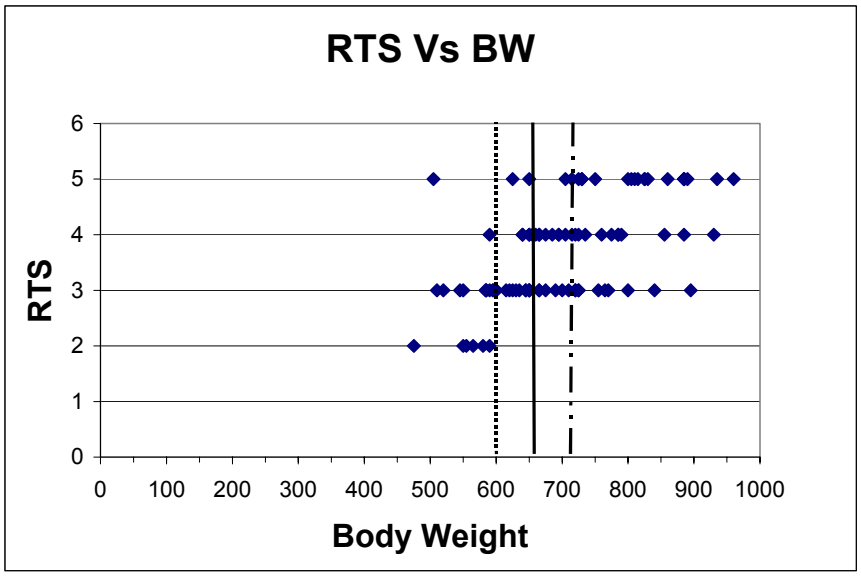


Table 4. Reproductive tract scores and related prebreeding measurements. Kentucky data from 1200 heifers (Patterson et al., 1994)

Reproductive Tract Score	Prebreeding weight (lb)	Pelvic Height (cm)	Pelvic Width (cm)	Pelvic Area (sq cm)
1	$590^{a} \pm 5.5$	$14.2^{a} \pm .23$	$10.8^{a} \pm .19$	$156^{a} \pm 4$
2	$625^{b} \pm 6.6$	$14.3^{a} \pm .08$	$11.2^{b} \pm .06$	$161^{a} \pm 1$
3	$717^{c} \pm 9.9$	$14.6^{b} \pm .04$	$11.4^{c} \pm .04$	$167^{b} \pm 1$
4	$724^{c} \pm 9.9$	$14.7^{b} \pm .07$	$11.6^{d} \pm .06$	$171^{c} \pm 1$
5	$763^{c} \pm 9.7$	$14.7^{b} \pm .06$	$11.7^{d} \pm .05$	$173^{c} \pm 1$

^{a,b,c,d} Numbers with different superscripts within column differ ($P<.05$)

Table 5. Correlation coefficients for prebreeding measurements (Patterson et al., 1994)

	Weight	Pelvic area	Pelvic Height	Pelvic Width
RTS	.39*	.31*	.27*	.29*
Weight	1.0	.55*	.54*	.37*

However, selection of heifers only on body weight at 12-14 months without regard to actual measurements of RTS could result in later maturing animals. Selection for increased growth rate and frame may result in later maturing animals and delayed puberty. In addition, in a study sponsored by the American Angus Association, it was reported that heifers and cows with extremely high growth and/or milk EPD's reached puberty later and had larger post partum intervals (Crouch, personal communication).

The effect of sire on RTS score in an actual VA herd is illustrated in Table 6. All heifers were 14 months of age and weighed 750-900 lbs. However, one sire produced more RTS2 daughters. The numbers in this example are extremely small, but they illustrate the potential for a sire effect on RTS and the need for RTS as a routine practice in selecting heifers.

Table 6. Influence of sire on reproductive tract scores in 14-month-old heifers

Sire	Reproductive tract Score				Average reproductive tract score
	2	3	4	5	
	--Number of heifers----				
75	3	0	1	1	3.00
87	0	4	0	1	3.40
165	1	3	2	2	3.63

(Hall, unpublished)

Summary

Selecting for a variety of traits can inadvertently impact age at puberty and fertility in heifers. By using a combination of body weights and reproductive exams, producers can select heifers that meet the industry's requirements for growth and efficiency while maintaining a high level of fertility.

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